COOK LAKE

Introduction

Cook Lake is an small, natural lake on the west slope of Boulder Mountain in south-central Utah. It is one of the hundreds of lakes on the mountain. These lake basins are the result of uneven glacial scouring, and most, including Cook Lake, have not been further modified by people.

The reservoir shoreline is owned and administered by the Dixie National Forest with unrestricted public access. Water is used for recreation and cold-water aquatic habitat. No changes in water use are foreseen.

Characteristics and Morphometry

Lake elevation (meters / feet)	3,225 / 10,580
Surface area (hectares / acres)	4.2 / 10.4
Watershed area (hectares / acres)	
Volume (capacity) (m^3 / acre-feet)	106,200 / 86.1
Annual inflow (m^3 / acre-feet)	not measured
Retention time (years)	unknown
Depth (meters / feet)	
maximum	5.5 / 18
mean	2.5 / 8
Length (meters / feet)	545 / 1,790
Width (meters / feet)	91 / 300
Shoreline (meters / feet)	1,210 / 3,980

Location

County	Wayne
Longitude / Latitude	111 32 21 / 38 10 41
USGS Map	Government Point 1985
DeLorme's Utah Atlas and Gazetteer™	Page 27, C-6*
Cataloging Unit	Fremont River (14070003)

*Not on map. On Trail 119 just north of its junction with FR-178

Recreation

Most of the lakes on the west slope are near the top of the slope from the Fremont Valley (Loa area) to Boulder Mountain, necessitating long climbs on improved gravel roads and trails. Cook Lake was chosen for the clean lakes study because it is relatively easily accessible, being located just off the road to the top of Boulder Mountain.

Cook Lake is ten miles east of Posey Lake Road on the Boulder Mountain Road (FR-178). The Posey Lake

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Road runs from Loa to Escalante, and the Boulder Mountain Road turnoff is about 11 miles south of Loa. Cook Lake is on the east side of the road. The existing road bypasses the lake, but the old road goes right past it. Turn on the old road, a sharp left, just before the final incline up the cliff to the top of the mountain. If you get to the top (a flat area of miles and miles rolling meadows interspersed with groves of trees), turn around and go back down the cliff and make a half right (onto the old road) at the bottom (0.5 miles from the beginning of the descent). The lake is 0.5 miles north of the main road on the old road. Access roads are not maintained in the winter, but the lake is easily reached on cross-country skis or by snowmobile.

Fishing and camping are the activities available at the reservoir itself, but the surrounding region is replete with hiking areas. The water is too cold for most swimmers and too small for most boaters.

There are no USFS campgrounds in the vicinity, although primitive camping is possible throughout the area. Heavy recreational use has scarred the west side of the lake. Campers should choose a preexisting campsite and build small fires on preexisting fire sites.

There is an RV park in Bicknell (see info box).

Watershed Description

Cook Lake is at the top of a long, forested slope that begins at the crest of Boulder Mountain. From the plateau top at 3,500 meters, the land drops off down to the Fremont Valley at 2,200 meters. At the top of the slope, an impressive 100 meter cliff completes the gradient to the top of Boulder Mountain. Cook Lake is in a basin immediately below the cliff (which is reduced to a steep slope at that point). Much of the lake shore (40%) is composed of boulders, which provide good aquatic habitat. The remainder is sand, silt and gravel.

The area around the lake is coniferous forest interspersed with meadows. The Dixie National Forest reports that "the riparian area has been impacted by camping and livestock overgrazing and should be protected to prevent [further] erosion." Slopes to the west are gentle, but to the east lies a vertical cliff which rises to the rim of the plateau.

The watershed high point, the north shoulder of Lookout Peak, is 3,379 m (11,085 ft) above sea level, thereby developing a complex slope of 6.9% to the lake. The Forest Service reports no visible inflows the lake, although the USGS 7.5 minute map shows a small stream from the south with an average stream gradient of 0.6% (33 feet per mile). The outflow is to the north, and becomes subterranean in Cook Pasture. It probably reappears in springs downslope in Fremont Valley.

The soil is of volcanic origin. The soil associations that compose the watershed are found in Appendix III.

The vegetation communities are comprised of pine, aspen and spruce-fir. The watershed receives 76 cm (30 inches) of precipitation annually with a frost-free season of 0 - 20 days at the reservoir.

Land use is multiple use and recreation. Dixie National Forest encompasses the entire drainage area.

Limnological Assessment

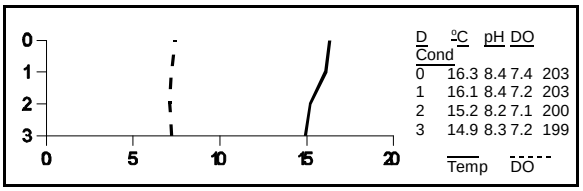
The water quality of Cook Lake is very good. It is considered to be very soft with a hardness concentration value of approximately 10 mg/L (CaCO3). The only parameter that has exceeded State water quality standards for defined beneficial uses is phosphorus. The average concentration of total phosphorus in the water column in 1990 was 36.5 which exceeds the recommended pollution indicator for phosphorus of 25 ug/L. The phosphorus concentration in 1992 did not exceed State standards with a average concentration of 24.3 ug/L. The lake is

Limnological Data

Data sampled from STORET site: 595562

Surface Data	1981	1990	1992
Trophic Status	M	M	M
Chlorophyll TSI	-	45.68	48.96
Secchi Depth TSI	-	44.66	43.47
Phosphorous TSI	47.35	41.68	51.68
Average TSI	47.35	44.01	48.04
Chlorophyll a (ug/L)	-	4.7	6.5
Transparency (m)	-	2.9	3.15
Total Phosphorous (ug/L)	20.0	14	27.0
pH	7.9	8.3	8.3
Total Susp. Solids (mg/L)	5	<3	3
Total Volatile Solids (mg/L)	-	-	3
Total Residual Solids (mg/L)	-	-	2
Temperature (°C / °f)	17/63	14/58	15/59
Conductivity (umhos.cm)	12	30	108
Water Column Data			
Ammonia (mg/L)	0.1	0.03	0.03
Nitrate/Nitrite (mg/L)	0.08	-	0.02
Hardness (mg/L)	11	9	9
Alkalinity (mg/L)	-	9	9
Silica (mg/L)	-	-	0.5
Total Phosphorus (ug/L)	-	18	24.3
Miscellaneous Data			
DO (Mg/l) at 75% depth	6.8	6.3	7.1
Stratification (m)	NO	NO	NO
Limiting Nutrient	N	N	N
Depth at Deepest Site (m)	4	2.2	3.0

characterized as "shallow" and no stratification of the reservoir has been present during scheduled monitoring visits. It appears that there is sufficient concentration of dissolved oxygen throughout the water column and that the temperature regime is supportive for a cold water fishery as depicted in the August 20, 1992 profile. The lake is characterized as a nitrogen limited system. TSI values indicate the reservoir is mesotrophic. It does not appear that there has been a significant rise in the concentrations of nutrients in the lake since it was originally surveyed in 1981. According to DWR it is not uncommon to have annual fish kills during the winter season. This is probably due in fact to the length of the winter, a small storage capacity, and the lack of a perennial stream into the lake. The reservoir has supported populations of brook trout (*Salvelinus fontinalis*), rainbow trout (Oncorhynchus mykiss), and arctic grayling (*Thymallus arcticus*). DWR manages the lake as an intensive yield water stocking fingerling brook trout and antic grayling with catchable size rainbow trout. There is a concern for erosion in the area due to grazing and recreational use. The current depth of the lake will not allow for large accumulation of sediment which could lead to an eventual loss of the fishery.



Cook Lake has not been treated by the DWR for rough fish competition. There is no stream connection to the Fremont River, so there were probably no fishes in the lake before Europeans stocked trout. The lake is managed as an intensive fishery, and there are no spawning areas in the lake, so all fishes in the lake are hatchery fish. Other Boulder Mountain lakes were also without fish before man planted them. Fishes are not native to this region.

Phytoplankton in the euphotic zone include the following taxa (in order of dominance)

Species	Cell Volume (mm^3/liter)	% Density By Volume
Anabaena spiroides var. crassa	23.128	70.55
Sphaerocystis schroeteri	5.282	16.11
Gloeocystis sp.	3.169	9.67
Peridinium sp.	0.722	2.20
Cosmarium sp.	0.234	0.71
Asterionella formosa	0.095	0.29
Pennate diatoms	0.056	0.17
Chlamydomonas sp.	0.033	0.10
Oocystis sp.	0.018	0.05
Staurastrum gracile	0.017	0.05
Dinobryon divergens	0.012	0.04
Centric diatoms	0.009	0.03
Oscillatoria princeps	0.005	0.02
Total	32.780	
Shannon-Weaver [H']	0.93	
Species Evenness	0.36	
Species Richness	0.50	

As observed the phytoplankton community is dominated by blue-green algae which are indicative of eutrophic conditions. There are also significant numbers of green algae present.

Information

Management Agencies	
Dixie National Forest	586-2421
Teasdale Ranger District	425-3435
Six County Commissioners Association	896-9222
Division of Wildlife Resources	538-4700
Division of Water Quality	538-6146
Recreation	
Aquarius Mobile and RV (Bicknell RV Park)	425-3854
Panoramaland Travel Region (Richfield)	896-9222

Pollution Assessment

Nonpoint pollution sources are grazing and recreation. As mentioned in the recreation section, the lake suffers abuse from campers as well as overgrazing. Cattle graze in the watershed and around the lake. While the Dixie National Forest hopes to begin harvesting timber on Boulder Mountain by the end of the decade, Cook Lake and its watershed are likely in the "beauty strip" that would not be cut even if sales were approved in the area.

There are no point pollution sources in the watershed.

Beneficial Use Classification

The state beneficial use classifications include: boating and similar recreation (excluding swimming) (2B), cold water game fish and organisms in their food chain (3A) and agricultural uses (4).